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Note

Each paper in this journal serves as an example of the scholarship being produced by students at Birmingham-Southern College. As such, it attempts to reproduce papers in the format of the discipline in which it was created. As a consequence of this attempt, there are minor inconsistencies of style throughout the publication. These have been retained as a subtle celebration of the diversity that makes *SAR* well-representative of the liberal arts education found at Birmingham-Southern College.

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"The Determination of Acetylcholinesterase and Butrylcholinesterase Presence in Horse Serum"

James Watters and Gretchen Repasky

Abstract

We determined that butyrylcholinesterase was the enzyme present in horse serum. The molecular structure of acetylcholinesterase revealed that the enzyme can only bind with acetylcholine because the volume of its active site was 986.2 $Å^3$. BuChE had a less specific catalytic gorge with a volume of 1624.3 $Å^3$, enabling it to bind with both acetylcholine (AsCh) and butyrylcholine (BsCh). Ellman assay was used to measure the percent cholinesterase activity in horse serum. The concentrations of AsCh and BsCh were then plotted against the percent cholinesterase activity. From the pooled data, the average V_{max} ratio was 1.65 indicating that BuChE was the enzyme present in horse serum. The concentrations of inhibitors Eserine, BW284c51, and Iso-OMPA were also plotted against the percent cholinesterase activity in horse serum. Iso-OMPA, the selective inhibitor of BuChE, fully inhibited the cholinesterase at 10^{-3} M confirming that BuChE is the inhibitor present in horse serum. The presence of BuChE in horse serum has been confirmed by both substrates and inhibitors.

Introduction

Cholinesterases

Cholinesterases are enzymes that hydrolyze acetylcholine (Moral-Noranjo 1996). Acetylcholinesterase is a particular type of cholinesterase found in all jawed vertebrates. Mainly found at the neuromuscular junction and in synapses of both the peripheral and central nervous system, AChE hydrolyzes the neurotransmitter acetylcholine into acetate and choline. Once hydrolyzed ACh activity ceases and the skeletal muscle relaxes.

Butyrylcholinesterase, another cholinesterase, is also found in the bodies of jawed vertebrates. Found throughout the body and in especially high concentrations in the liver, BuChE's function is currently unknown (Sutherland et al. 1997). Scientists, however, have suggested that butyrylcholinesterase present in human plasma may serve in the lungs and liver as a primary detoxifier of harmful compounds (Ashani 2000).

The catalytic gorges of AChE and BuChE are significantly different. Acetylcholinesterase's catalytic gorge and triad are buried deep inside. They are approximately 20 Angstroms (Å) from the surface of the enzyme. The catalytic triad consists of serine, glutamine, and histidine. The cavity traveling from the surface to the gorge is incredibly narrow. Therefore, AChE is limited in its substrate binding ability (Greenblatt et al. 2000).

Butyrylcholinesterase is different from AChE in two important ways. The first is that it replaces the aromatic residues which line the catalytic gorge of AChE with hydrophobic ones. The second is that it replaces the phenylalanine present in acetylcholinesterase with leucine and valine. This replacement enables larger substrates to be accommodated in the active site. In other words, BuChE can bind with more than one substrate (Suárez et al. 2005).

Distinguishing Between Different Types of Cholinesterases

One way to determine a specific cholinesterase is through substrate specificity. Acetylcholinesterase is only able to hydrolyze a particular substrate known as acetylcholine. Butyrylcholinesterase, on the other hand, is able to hydrolyze two substrates: acetylcholine and butyrylcholine (Greenblatt 2000). The best method for distinguishing between cholinesterases is to calculate the V_{max} of each one. The V_{max} of each enzyme can be divided by one another to give a ratio. This ratio can then be applied to range to verify the identity of the cholinesterase.

One way to determine a specific cholinesterase is through substrate specificity. Acetylcholinesterase is only able to hydrolyze a particular substrate known as acetylcholine. Butyrylcholinesterase, on the other hand, is able to hydrolyze two substrates: acetyl-

choline and butyrylcholine (Greenblatt 2000). The best method for distinguishing between cholinesterases is to calculate the V_{max} of each one. The V_{max} of each enzyme can be divided by one another to give a ratio. This ratio can then be applied to range to verify the identity of the cholinesterase.

Diagnostic Inhibition

Eserine inhibits AChE and BuChE alike. It does so at low concentrations. In an experiment conducted by Scaps et al. (1996), the eserine fully inhibited acetylcholine hydrolysis at a 10^{-3} M concentration. BW284c51 is an AChE specific inhibitor (Reuveny et al. 2000).
Iso-OMPA is a selective inhibitor of BuChE. A particular experiment revealed that Iso-OMPA at a 10^{-4} M concentration only slightly lowered the percent cholinesterase activity (Scaps et al. 1996).

Previous Experimentation

Many experiments have been conducted regarding cholinesterases in horse serum. In a particular experiment, gel electrophoresis was used to determine the molecular weight of a non pure enzyme present in horse serum, the enzyme's active sites, and the substrate. The data was then compared with pure AChE and BuChE (Main et al. 1971). In another experiment, the slope of cholinesterase present in horse serum was observed under varying conditions. Temperature, pH, and the concentration of choline were all manipulated to see the effects on the initial velocity (Balcom 1969). Based on previous experimentation, we predict that BuChE will be present in the horse serum because BuChE is found throughout the body and not only in select areas like AChE. Both eserine and Iso-OMPA inhibit BuChE. We can tell if BuChE is present in the horse serum easily if increasing concentrations of these inhibitors decrease percent cholinesterase activity.

Methods and Materials

Molecular Modeling of Enzymes and Inhibitors

We viewed the primary and secondary structures of AChE. We were able to rotate the structures in any direction. This enabled us to see the depth of the enzyme. In the secondary structure view, we counted the number of beta sheets and alpha helices and observed any patterns. Next, we searched for the hydrophobic and hydrophilic molecules in the structure. We also determined the amino acids present in the catalytic triad of AChE. Then, we compared the external binding sites of BuChE with AChE. We viewed how the substrate Sarin docked with the catalytic gorge of AChE. Next, we determined the volumes of the catalytic gorges of AChE and BuChE.

We built the following primary structures of inhibitors one molecule at a time: decamethonium, BW284c51, Iso-OMPA, and ethopropazine. Next, we minimized the primary structures into their most stable formation. Then, we measured the lengths and widths of each inhibitor. We predicted the inhibitor specificities by calculating their volumes and comparing them with the volumes of the catalytic gorges of BuChE with AChE. Then we located the actual specificities using <http://bioweb.ensam.inra.fr.ESTHER/general?what=index>.

Ellman Esterase Assay

We observed the effects of increasing concentrations of AsCh and BsCh on the cholinesterase activity in horse serum. This data enabled us to distinguish the cholinesterase present in the serum. Because Ellman solution expresses color when two specific products react, we used it to observe the percent of cholinesterase activity. We created nine tubes with substrate solution (AsCh or BsCh), Ellman solution, horse serum, and buffer. Two control tubes were also created. -C was made to blank the spectrophotometer and +C was made with no substrate to serve for comparison. Setting the spectrophotometer at 410 nm, blanking with –C, and incubating the experimental tubes for 2 minutes, we determined the initial velocities of each concentration of substrate. Next, we determined

the K_m, and V_{max} of the ChE present in horse serum for both the hydrolysis of AsCh and BsCh.

In a separate experiment, we observed the effects of the following inhibitors on percent cholinesterase activity in horse serum: Eserine, BW284c51, and Iso-OMPA. We used this data to distinguish the cholinesterase present in the serum. Each inhibitor had a different range of concentrations. We created nine tubes with substrate solution, Ellman solution, horse serum with the specific inhibitor, and buffer. Two control tubes were also created. -C was made to blank the spectrophotometer and +C was made with a lessened amount of serum with the inhibitor to serve for comparison. Setting the spectrophotometer at 410 nm, blanking with –C, and incubating the experimental tubes for 2 minutes, we determined the initial velocities of each concentration of inhibitor. Next, we converted the data for the slopes from Å/sec to µM BsCh hydrolyzed/min using the extinction coefficient.

Results

Molecular Modeling

In its primary structure, acetylcholinesterase appeared to be a long polypeptide chain of different amino acids. After minimization, the enzyme folded into a more compact secondary structure. We discovered 23 alpha helices and 17 beta sheets. When viewed as patches the alpha helices and beta sheets alternated. The sulfur atoms in the cysteine amino acids came together forming disulfide bonds. Hydrophobic in nature, these disulfide bonds were located on the interior of the protein. The majority of hydrophobic molecules were also located on the inside of the protein. Hydrophilic molecules were the most prominent on the outside. There were, however, some hydrophilic molecules in the inside of the cell that had been trapped by hydrophobic forces during minimization. Because AsCh is the only substrate that can bind with AChE, the catalytic triad of acetylcholinesterase was on the inside of the protein. The amino acids present in AChE were serine, glutamine, and histidine. A highly specific channel was also present, keeping

unwanted substrates form binding with the enzyme.

Because acetylcholinesterase and butrylcholinesterase differ in their substrate specificity, the structures of their binding sites and the volumes of their catalytic gorges also differ. Only able to bind with AsCh, AChE has identical binding sites, which are specific to the tryptophan amino acid. We found the volume of acetylcholinesterase's catalytic gorge to be 986.2 $Å^3$. Because BuChE is able to bind with both AsCh and BsCh, it has binding sites that can bind with more the one amino acid. The sites can accept either tryptophan or alanine. The volume of BuChE is 1624.3 $Å^3$, much larger than that of AChE.

Diagnostic inhibitors prevent substrates from binding with enzymes. In building decamethonium, BW284c51, Iso-OMPA, and ethopropazine, we found their lengths and widths (See Table 1). The class predicted specificity for each inhibitor corresponded with the actual specificities on BioWeb.

Substrate Specificity

AsCh is a substrate that can bind with both AChE and BuChE. BsCh, although compatible with BuChE, does not bind with AChE. The effects that increasing substrate concentrations have against the rate of cholinesterase hydrolysis are illustrated in a Michaelis-Menten kinetics graph (See Figure 1). In order to better see the change of cholinesterase activity, a double reciprocal graph was created (See Figure 2). The V_{max}, K_m, and V_{max} ratios of both substrates for our individual team and the other teams in the data pool are shown in Table 2. We were in accordance with the rest of the class in that butrylcholinesterase was the enzyme present in horse serum.

Inhibitor Specificity

Increasing mole concentrations of Eserine, BW284c51, and Iso-OMPA were plotted against percent cholinesterase activity in a dose response graph (See Figure 3). Eserine had almost fully inhibited the cholinesterase present in horse serum at a 10^{-5} M

concentration. BW284c51 fully inhibited the cholinesterase present in horse serum at a much higher concentration of 10^{-2} M. Iso-OMPA fully inhibited the cholinesterase present in horse serum at a 10^{-3} M concentration. The IC_{50} values for each inhibitor were placed into Table 3. Of the three diagnostic inhibitors, eserine had the lowest IC_{50} and BW284c51 had the highest IC_{50}. Both the IC_{50} data and the dose response curves were used to confirm that BuChE was the enzyme present in horse serum.

Discussion

In this experiment, we observed the primary and secondary structures, catalytic triads, and active sites of AChE and BuChE. We also determined volumes of the catalytic gorges of the two enzymes. In the next experiment, we observed the effects of increasing concentrations of substrate on the percent of cholinesterase activity in horse serum. We used this data to determine the ChE present in the serum. In the final experiment, we observed the effects of increasing concentrations of diagnostic inhibitors on the percent of cholinesterase activity in horse serum. We used this data to reaffirm the ChE present in the serum.

We found that AChE has a narrow channel and a small catalytic gorge. This signifies that it can only bind with AsCh. We determined that the volume of AsCh is of the appropriate size to fit into the active site of AChE. Greenblatt et al. (2000) affirms that the AChE channel is incredibly narrow and that the active site is highly specific. Because the binding sites of BuChE are different, they can bind with more than one substrate. The large size of the BuChE's catalytic gorge enables it to accept substrates both large and small. According to Suárez et al. (2005), butyrylcholinesterase replaces the phenylalanine present in acetylcholinesterase with leucine and valine creating a larger active site.

The fact that the volumes of decamethonium and BW284c51 fit into the active sites of ChE signifies that they are specific for that enzyme. In the same way, the fact the Iso-OMPA, and ethopropazine volumes fit into the active sites of BuChe signifies that they are specific for that enzyme. The BioWeb internet site

confirms that the predicted specificities of the class are in accordance with what has been proven scientifically.

The V_{max} ratios calculated from the Michaelis-Menten kinetics graph of AsCh and BsCh hydrolysis signify that BuChE is the enzyme present in horse serum. All the team values calculated in the data pool were between 1 and 2, making the enzyme butyrylcholinesterase.

In creating the dose response curve for eserine, we removed some data which made the percent cholinesterase activity exceed 100 percent. The effect of eserine on percent cholinesterase activity signifies that only a small concentration is necessary for complete inhibition. Our results indicated that at a 10^{-5} M concentration, eserine fully inhibited the cholinesterase activity in horse serum. According to the experiment Scaps et al. (1996) conducted, the eserine fully inhibited acetylcholine hydrolysis at a 10^{-3} M concentration. Our results were only different by a matter of 2 M. However, both our experiment and that of Scaps et al. (1996) show that a small amount of eserine is needed to inhibit the cholinesterase. Because eserine inhibits both AChE and BuChE we cannot infer that a specific enzyme is present in the horse serum.

The effect of BW284c51 on percent cholinesterase activity signifies that a significant amount is needed for complete inhibition. The fact that so much inhibitor is needed shows that it is not specific for the cholinesterase present in horse serum. In scientific literature, Reuveny et al. (2000) states that BW284c51 is an AChE specific inhibitor. Therefore, the cholinesterase present in horse serum cannot be AChE.

The effect Iso-OMPA on percent cholinesterase activity signifies that an amount of inhibitor approximately 10^{-3} M is necessary to completely inhibit the cholinesterase. The fact that a medium amount of inhibitor is needed shows that it is specific for the cholinesterase in horse serum. Scaps et al. (1996) revealed that Iso-OMPA is a selective inhibitor of BuChE. Therefore the enzyme present in horse serum must be BuChE.

In order to verify the accuracy of our data, we could run a Q test. The values gained from this test would inform us if any of the data from the class pool should be removed. Possible follow up

experiments could test BuChE specificity to other inhibitors and substrates, AChE and BuChE activity in other jawed vertebrates, and the function of BuChE in the horse.

We concluded that BuChE has a larger catalytic gorge than that of AChE and is less specific. Both AChE and BuChE can be used to determine the identity of a cholinesterase. Finally, BuChE is the cholinesterase present in horse serum proven by substrate and inhibitor activity.

Acknowledgements

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Tables and Figures

Table 1. Pooled Class Data for the Molecular Weights and Lengths of Diagnostic Inhibitors

Inhibitor	Team			Predicted Specificity	Actual Specificity
Decamethonium	Team 1a	17.38	3.066	AChE	AChE
	Team 2a	16.372	14.705	AChE	AChE
	Team 3a	17.026	3.063	AChE	AChE
	Average ± *SD*	16.93 ± 0.51	6.95 ± 6.72	AChE	AChE
BW284c51	Team 1b	24.024	10.309	AChE	AChE
	Team 2b	17.764	9.421	AChE	AChE
	Team 3b	21.481	9.182	AChE	AChE
	Average ± *SD*	21.09 ± 3.15	9.64 ± 0.59	AChE	AChE
Iso-OMPA	Team 1a	10.97	9.821	Bu-ChE	Bu-ChE
	Team 2a	8.103	8.87	Bu-ChE	Bu-ChE
	Team 3a	9.85	10.367	Bu-ChE	Bu-ChE
	Average ± *SD*	9.64 ± 1.44	9.69 ± 0.76	Bu-ChE	Bu-ChE
Ethoproazine	Team 1b	10.961	9.538	Bu-ChE	Bu-ChE
	Team 2b	10.121	7.154	Bu-ChE	Bu-ChE
	Team 3b	8.847	6.996	Bu-ChE	Bu-ChE
	Average ± *SD*	9.98 ± 1.06	7.90 ± 1.42	Bu-ChE	Bu-ChE

The diagnostic inhibitors' predicted specificities were determined with their lengths and widths. The actual specificities were found under the BioWeb internet site. Team 3b is highlighted because it denotes our individual team.

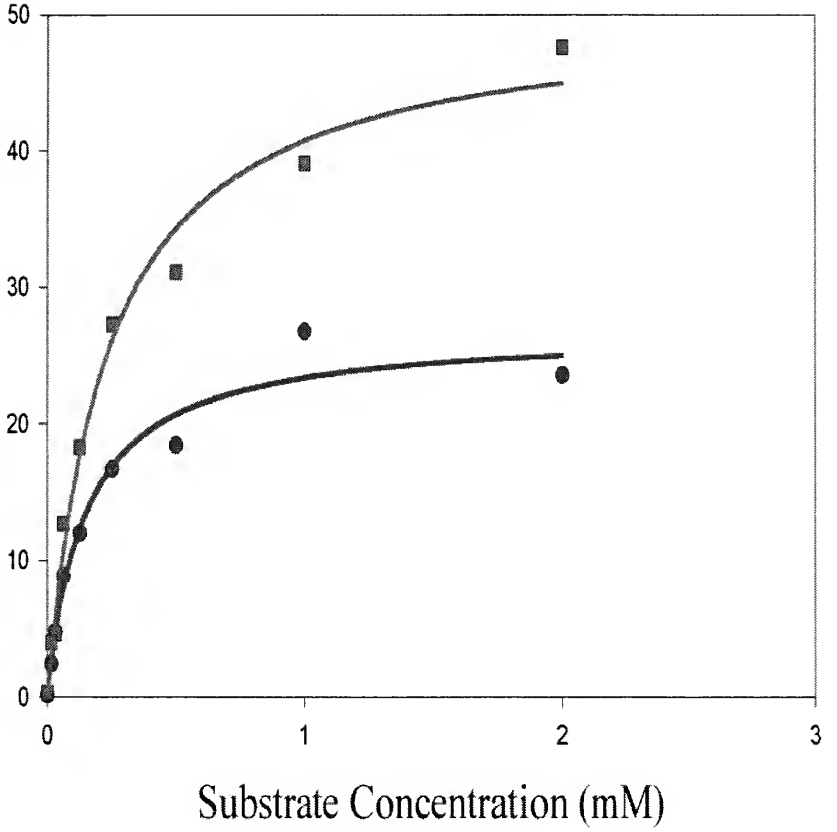

Figure 1. A Michaelis-Menten kinetics graph of AsCh and BsCh hydrolysis. The cholinesterase activity (μM/min) in horse serum is compared with the concentration of the two substrates (mM). The blue dots and line represent AsCh. The red dots and line signify BsCh.

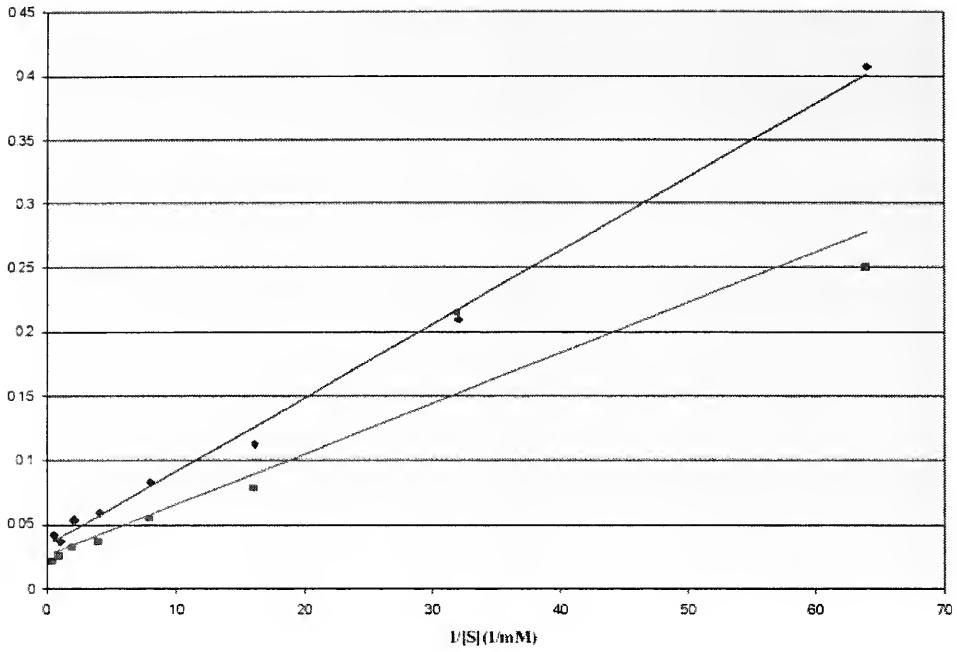

Figure 2. A double reciprocal graph of AsCh and BsCh hydrolysis. Redrawn from Figure 1, this graph shows 1/cholinesterase activity (μM/min) compared with 1/substrate concentration (mM). The blue dots and line signify acetylcholine. The red dots and line denote butyrylcholine.

Table 2. Pooled Class Data for Substrate Specificity in Horse Serum

Team Number	K_m	V_{max} (µM/ min)	K_m	V_{max} (µM/ min)	V_{max} ratio	Which ChE is in Horse serum?
1					2.49	BuChE
2					1.089	BuChE
3					1.48	BuChE
4					1.32	BuChE
5					1.87	BuChE
Team Average ± SD		21.87 ± 6.52	0.18 ± 0.18	35.94 ±15.25	1.65 ± 0.55	BuChE

The V_{max} values of AsCh and BsCh were used to determine the V_{max} ratio, which was used to find the ChE present in horse serum. V_{max} ratios between 1 and 2 are characteristic of BuChE. V_{max} ratios at 0.01 are characteristic of AChE. Team 5 is highlighted because it represents our individual team.

Figure 3. A dose response graph of diagnostic inhibitors. Percent cholinesterase activity (%) is compared with the log of the concentrations of the inhibitors (M). Each sigmoid line represents a particular diagnostic inhibitor. The red line and dots denote Eserine. The blue line and dots represent BW284c51. The green line and dots represent Iso-OMPA.

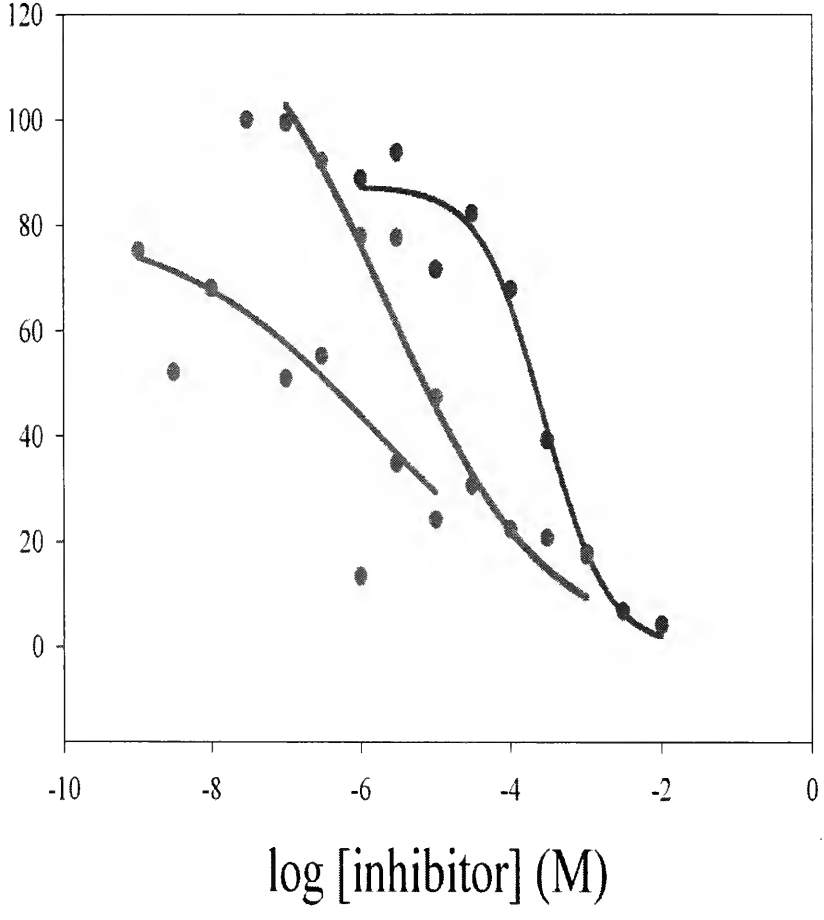

Table 3. IC_{50} values for Diagnostic Inhibitors

Inhibitor	**IC_{50} Values**
Eserine	1×10^{-7}(M)
BW284c51	1×10^{-4}(M)
Iso-OMPA	1×10^{-5}(M)

Each inhibitor's IC_{50} value was determined using the dose response graph illustrated in Figure 3. An IC_{50} value signifies 50 percent cholinesterase activity (%) compared with the log of the concentrations of the inhibitors.

The Kingdom and Society: An Analysis of the Theological and Social Similarities between Martin Luther King, Jr. and Walter Rauschenbusch

Caitlin Hartley

For many, Dr. Martin Luther King's legacy lies strictly in the area of socio-political change, but likely he would point first to his theology as the basis for his understanding of ethics, political and otherwise. Much of King's activism stems from his understanding of God and humanity – his rejection of the spiritualization of the Church, his emphasis on the importance of one's present mortal life, as well as his personalism all fit into his understanding of the God-to-human and human-to-human relationships. King was originally a student of theology, not of politics. His leadership in the Civil Rights movement grew out of his theological and ethical understanding.

When recounting his theological training, King points to several influential theologians, one by the name of Walter Rauschenbusch, a white American scholar who lived and wrote at the turn of the century. King suggests that Rauschenbusch's writings, particularly *Christianity and the Social Crisis*, gave voice to his intuitions about the role of the Church in social and political areas (Carson 18). King's comment, however, is not without criticism of Rauschenbusch. King lists specific points of disagreement, and several scholars have argued that Rauschenbusch and his contemporaries in the Social Gospel movement provide a poor foundation for the theology behind the Civil Rights movement, largely because of their relative silence on the issue of race. Rauschenbusch and his colleagues produced valuable theological works, but their relationship to Dr. King is largely academic – King left behind the white Social Gospel at Crozer Seminary and in order to work beyond it.

My purpose in this paper is to challenge this assumption of the limited connection between Rauschenbusch and King. The two were more personally and theologically similar than perhaps even King realized. And while the two were separated by a generation,

their paths of theological development began and ended in much the same way, with analogous milestones along the way. Rauschenbusch was more concerned with race than many scholars recognize, and King was more concerned with issues of class than many scholars emphasize. Had the two lived at the same time, they likely would have been almost theologically indistinguishable.

The theology of the social gospel is largely influenced by eschatological understandings. Many oppressed or alienated communities turn to apocalypticism and premillennialism. Premillennialism, as well as postmillennialism, revolves around the Christian tradition that toward or at the end of history, there will be a thousand-year reign of peace. Premillennialists believe that Christ will return to Earth at the beginning of this thousand-year period; whereas postmillennial thinking has Christ returning afterward. The difference, though it seems subtle, has important implications. Premillennial thinkers tend to believe that human society grows gradually worse over time, and when Christ finally returns, he will come to overturn and violently destroy the world in order to recreate it for the thousand-year reign of peace. Critics generally see this view as an encouragement of quietism and apathy toward social issues. Postmillennialists, however, feel that human beings are responsible for improving civilization over time, and once we have achieved peace, then the thousand-year span can begin. Critics view this stance as naively optimistic, since it relies on human beings to usher in the second coming of Christ (McGrath 481-82).

Social gospel theologians tended to fall in the latter camp, calling on the Church to bring about social reform and help to establish the Kingdom of God on Earth. Social gospelers and other postmillennialist thinkers fell under another category – that of theological liberalism. These theologians, in response to Enlightenment emphasis on reason, sought to reconcile Christianity not only with science, but also with contemporary culture. Many critics saw liberal theologians as spiritually irresolute, caring more about making Christianity suit the current society than about affirming Christian doctrine. A branch of liberal theology, proponents of the social gospel movement saw the Holy Spirit working in and through culture. In true postmillennialist fashion, they saw the

final Kingdom of God as the redemption and fulfillment of society, not as a new order to be established only after this world/society/culture has been destroyed. Moreover, it is up to the Church to bring about this fulfillment through ethical reform and social progress (Braaten 352-53).

According to scholar Rufus Burrow, critics have identified four key limitations within the social gospel movement. First, they charge that "social gospelers neglected the individual and focused solely or primarily on the social" (37). These opponents were largely concerned that social gospel thinkers failed to emphasize adequately the doctrine of personal salvation, though no members of the movement are recorded as outwardly denying its importance. The second criticism, one which King alluded to, is the tendency of social gospelers to equate the Kingdom of God with a particular social or economic order.

Another problem that concerned King as well as other critics was the belief in inevitable progress – a concept drawn from social Darwinism that critics claimed could lead to stagnancy and apathy in the face of injustices. Shailer Mathews, another scholar of the social gospel, points out that many older theological understandings did not allow for the participation of human beings in the coming of the Kingdom.

> It was the work of God in which men had no real part. The social gospel was aggressively ethical. It naturally produced moral discontent rather than spiritual complacency (Burrow 37).

Rather than encouraging passively waiting for God to act, the social gospel taught that human beings could help to usher in the Kingdom. The social gospelers were too committed to active participation in bringing about God's Kingdom to be convicted of quietism. Still, many adherents to the social gospel did adopt the idea of inevitable progress, a concept which has led others to consider the whole movement a demonstration of naïveté.

Perhaps the most important criticism of the social gospel concerns the problem of evil. Many, including King, felt that social gospelers gravely underestimated the depth and seriousness of human sin and evil. While this is true of many proponents of the social gos-

pel, it is not entirely true of Rauschenbusch. Initially, Rauschenbusch's discussion of the "salvation of the super-personal forces" such as major corporations or any other powerful body made up of individuals (Burrow 39), may seem to indicate that he falls into the naïve camp of other social gospelers. He does discuss these super-personal forces in terms of salvation comparable to that of individuals, but he does recognize the difficulty of change within these forces, especially major businesses. He also avoids the trap of thinking that simply because a person (or super-personal force) becomes aware of sin, he or she will naturally turn away from it. Rauschenbusch, like King, affirmed the place of the church in pressuring politicians, corporations, and organizations into ethical practice. According to Rauschenbusch, the ultimate root of sin was selfishness, which grows stronger when attached to money. He put it this way:

> "Ordinarily sin is an act of weakness and side-stepping, followed by shame the next day. But when it is the source of prolific income, it is no longer a shame-faced vagabond slinking through the dark, but an army with banners, entrenched and defiant. The bigger the dividends, the stiffer the resistence against anything that would cut them down. *When fed with money, sin grows wings and claws*" (Burrow 40).

This quote in particular illustrates Rauschenbusch's stance on the depth and prevalence of sin, never denying the power or presence of evil.

The final major criticism of the social gospel concerns the problem of race. Most social gospelers remained silent on the issue, choosing to emphasize the plight of the poor laborer. Author Robert Handy says that "[a]s the early social gospel leaders saw it, a major step had been taking for the Negro with the abolition of slavery; now it was the turn of the wage-slaves to be freed" (Burrow 41). Many social gospelers, while perhaps not overtly racist, saw their present call as one to the economically oppressed rather than to the racially oppressed. While Handy claims that social gospelers did "touch upon other causes, including race and woman

suffrage," another author, Jacob Dorn, is less understanding. According to Dorn, social gospelers "were for the most part strikingly silent of the problem of race in the United States" even though the problem was at least as obvious as that of labor capital (Burrow 41).

It is perhaps in the problem of race that Rauschenbusch is most naïve. When asked about his years of silence on the issue, he responded by saying, "For years the problem of the races in the South haws seemed to me so tragic, so insoluble, that I have never yet ventured to discuss it in public" (Burrow 49). This statement, while confirming that Rauschenbusch was no blind optimist, does betray his misunderstanding of racism – that it was largely a sectional issue. Even his later more radical comments retain an air of condescension and naivety. At one point, he went so far as to say the following:

> "However great the practical difficulties may be, the Christian way out is to take our belated black brother by the hand and urge him along the road of steady and intelligent labor, of property rights, of family fidelity, of hope and self-confidence, and of pride and joy in his race achievements..." (Burrow 48).

The paternalistic tone of statements like these has not been lost on Christopher Evans, a leading biographer of Rauschenbusch. "For a white progressive of his era," Evans claims, "Walter Rauschenbusch's views on racism were neither exceptional nor intentionally malevolent – they were tragically typical" (Evans 255). Another author considered the issue of racism to be Rauschenbusch's "moral blind spot" (Burrow 50).

Other researchers, however, have come to different conclusions regarding proponents of the social gospel, Walter Rauschenbusch in particular. His first biographer, Dores Sharp pointed out that "the great migration of Negro life from the South to the industrial centers of the North had scarcely taken place during his lifetime and had definitely not taken place at the time of the writing of his first great book" (Burrow 48-49).). Rauschenbusch, then, would not have been entirely incorrect in considering that the issue

of racism chiefly a sectional problem. Evans, in spite of his biting analysis of Rauschenbusch's prejudices, claims that most of his racist tendencies (however subtle) were "due to a lack of first-hand exposure to the plight of African-Americans" (Evans 255). While the suffering of the laborer was present and obvious to him, Rauschenbusch had no real experience with the oppression face by African Americans. The aforementioned Rauschenbusch quotes indicate that he recognized the injustice of racism, even if he was unable to address it adequately.

However, even if he had been influenced by blacks and their struggles, his words would still have been radical, and some suggest that he might have been more vocal still if it would not have alienated his liberal white base. At one point, Rauschenbusch made a comment strangely reminiscent of King's principles of nonviolence:

> I have no faith in force methods, and even believe in non-resistance, but not in a non-resistance based on cowardice and silence. There was nothing cringing in Jesus. He did not strike back, but neither did he flinch. He was 'the terrible meek.' I am thinking of the Negro race in saying this (Burrow 53).

While this statement initially may sound more like the letter which prompted Kings "Letter from a Birmingham Jail," Rauschenbusch is not urging African Americans simply to wait for improvement, but rather to act. Many social gospelers believed (perhaps much like the white clergy who wrote to King) that problems of race and gender would be addressed by the growth of democracy and increased economic reform, but Rauschenbusch clearly calls for action from oppressed blacks. In calling for nonviolence, he does not advocate merely facing one's oppressors and showing courage in the face of suffering – he specifies that this kind of active non-resistance does not include silence.

Rauschenbusch's subtle racist leanings can be understood (though not excused) by his lack of experience with the plight of African Americans. Additionally, his focus lay in issues of economic class, and it is not unreasonable to think, as many social gospel proponents did, that to address economics is to pave the

road for racial equality. Rauschenbusch even made some controversial statements (mentioned above) regarding race. Scholars rebuke him for not having said more, but considering the context, he said a great deal. To have said much more would have alienated those who supported him, and since it is clear that, for Rauschenbusch, issues of poverty took precedence over other social problems. Likely he would have wanted to maximize the good he could do for the poor laborer; and he might ultimately help oppressed African Americans by first addressing economic concerns. He was doing and saying more about race than one could reasonably expect of a white member of the social gospel movement at the turn of the twentieth century.

Rauschenbusch and King hold several important experiences in common, which likely led to their theological similarities. Not only did both come from a long line of ministers, they also both emerged from the Baptist tradition. Rauschenbusch's father converted from the German Lutheranism of his ancestors in 1850 (Evans 8), and King was quoted as saying, "My father is a preacher, my grandfather was a preacher, my great-grandfather was a preacher… So I didn't have much choice" (Carson 1). Additionally, both criticized the fundamentalist tendencies within their parents' faith. While at Morehouse College, King rebelled against his parents' religion of "shouting and stamping," confessing that it embarrassed him (Carson 15). Likewise, Rauschenbusch's father, August Rauschenbusch, adhered to strict theological conservatism and pietism, especially the infallibility of scripture – he considered faith to be an "all or nothing" commitment (Evans 5).

Walter Rauschenbusch, however, ultimately fell under the theologically liberal camp, which allowed for the allegorical interpretation of scripture and sought to make Christianity more accessible to those who had rejected it. August Rauschenbusch would likely have seen this as a complete rejection of Christian fundamentals. Interestingly, too, in their theological educations, both men studied the prophet Jeremiah and his role rebuking the people of Israel for their disregard for the poor (Burrow 39). They would ultimately come to see the Church's role as the prophetic voice of society, always calling for justice and serving as a reminder of the

society's fundamental values and goals.

The two theologians also had comparable cultural experiences in their youth which gave them a broader understanding of American society. King spent a summer working in the North, and later, attended school there (Carson 11). The difference in treatment he experienced led him to question further the role of the African American in the South and in the United States. Similarly, Rauschenbusch spent a brief period in England, where he experienced Anglican Christian Socialism, which put him on the track toward the economically-focused social gospel (Evans 31). Their exposure to new cultures and ideas helped both leaders begin their journeys toward a theology based in social reform.

Both men studied Marx and criticized capitalism. In Clayborne Carson's compilation of King's work into an autobiography, King begins his discussion of Marxism by rejecting its "materialist interpretation of history," ethical relativism, and tendency toward totalitarianism (Carson 20). From here, however, King goes on to point out the important qualities of Marxism, even suggesting that exploring alternatives to capitalism is a Christian duty, saying "communism grew as a protest against the hardships of the underprivileged... The Christian ought always to be challenged by any protest against unfair treatment of the poor" (21). In spite of his careful and deliberate denunciation of Marxism, King confesses that he had long been aware of the gap between the rich and poor and that "Marx made [him] ever more conscious of that gulf" (21). From here King goes on to criticize capitalism directly, while still affirming his rejection of Marxism:

> [C]apitalism is always in danger of inspiring men to be more concerned about making a living than making a life. We are prone to judge success by the index of our salaries or the size of our automobiles, rather than by the quality of our service and relationship to humanity. Thus capitalism can lead to a practical materialism that is as pernicious as the materialism taught by communism (Carson 21).

Rauschenbusch too read Karl Marx and found similar insights, though he was more intensely influenced by Christian socialism. He based his economic philosophy not on chiefly Marx,

though, but rather on "the democratic ethos of Jesus" (Evans 180). Like King, he rejected Marx's materialism, but acknowledged the truth in many of his criticisms of capitalism. In his article "New Evangelism," Rauschenbusch sought to encourage the Christian Church to see the present social crisis as an opportunity for constructive economic reform (181). He claimed that capitalism dehumanized workers, and that socialism would ultimately prove to be the fairest and most sensible solution to the labor problem. He dealt harsh criticism to the wealthy regarding their capacity for ethical and compassionate behavior saying,

> Tell a man who is bathing: 'You can tie as many pounds of lead to your feet as you please, as long as you keep your head above water"; and then tell young men: 'You can be as rich as you please, but you must not let your property, either in the getting or the having or the spending, have any evil effect on your moral and spiritual life (Rauschenbusch).

Toward the end of his life, King too came to the conclusion that "there must be a better distribution of wealth and maybe America must move toward a democratic socialism" (King).

Apart from the obvious similarities in their theological journeys, King and Rauschenbusch ultimately held many comparable theological views – King was more in line with the social gospel than perhaps he realized. King made the following statement regarding Rauschenbusch:

> It has been my conviction ever since reading Rauschenbusch that any religion that professes concern for the souls of men and is not equally concerned about the slums that damn them, the economic conditions that strangle them, and the social conditions that cripple tem is a spiritually moribund religion only waiting for the day to be buried… Therefore, I must be concerned about unemployment, slums, and economic insecurity. I am a profound advocate of the social gospel (Carson 18-19).

A key factor in postmillennialist social gospel theology is

the affirmation of the present world and one's present life. In the quote above, King clearly supports this position that values more than just the spiritual aspects of humanity. Social gospelers were quick to reject any notion of liberation relegated only to the spiritual realm. Since social gospel proponents affirm humanity's ability to help bring about the Kingdom of God through progress on earth, few could accept a concept of freedom that relied on the doctrine of heaven. Critics have often said that social gospelers were not concerned enough with the salvation of individual souls. The social gospeler might not reject this, saying perhaps that he or she is committed to the betterment of humanity as a whole over individual salvation experiences. King might have privately felt similarly, since his legacy is one of social justice rather than one of Christian conversions. Most would probably consider his legacy to be more in the camp of Mahatma Gandhi than Billy Graham, though it would seem the latter (a Southern Baptist like King) ought to have been more ideologically similar to King.

Also like Rauschenbusch, King considered himself a liberal theologian. After grappling with the fundamental nature of humanity, he began "to see some noble possibilities in human nature" (Carson 25). Even after experiencing Southern segregation starkly contrasted to his experiences in the North, King ultimately concluded that human beings were essentially good, in part because he saw improvement in racial tensions. He felt that liberal theology offered him an "intellectual satisfaction that [he] had never found in fundamentalism" (Carson 24).

Later, though, King studied Reinhold Niebuhr, a theologian of the neo-orthodox movement which many scholars consider to be little more than a reaction to Christian liberalism and the social gospel. Already having studied Gandhi, King was committed to nonviolence, but Niebuhr's "Christian realism" led him to question the efficacy of such a philosophy (Carson 24-25). King never renounced his belief in the human potential for good, but Niebuhr brought King to the recognition of "the complexity of man's social involvement and the glaring reality of collective evil" (27). King then sought to find some realistic pacifism, deciding that pacifism, rather than being a sinless solution, was really only "the lesser evil

in the circumstances" (27).

Rauschenbusch encountered this when he stood against World War I. He could not deny the strong international tension of the time, but he was resolute in his belief that the least sinful alternative was that of neutrality. While many accused him of loyalty to Germany (his father had grown up there, and Walter had studied their for four years as a young adult) and called him naïve for his stance, he stood genuinely for pacifism, pointing out the multiple issues at home upon which the government ought to declare war, such as hunger, inflation, and class division (Evans 288). King too spoke out against a war, with deep concern about reaction similar to that which Rauschenbusch received, waiting to decide whether or not he ought to address the issue publicly (Carson 335). Eventually, King felt that he "had to disavow and dissociate [him]self from those who in the name of peace burn, maim, and kill" (336). Both grappled with their consciences and concern about public reception, but the two men reached the same conclusion – that it was preferable to risk disapproval and speak out against war than to remain silent.

Among King's final major acts was participation in the Poor People's Campaign and his speech to the striking sanitation workers. In his speech to the sanitation workers, King recalls the parable of the rich man (Dives) and Lazarus. In the parable, the rich man, Dives, cries out from hell to Lazarus, a poor man who is now in heaven. In his analysis of the parable, King calls for economic reconciliation, saying

> Dives didn't go to hell because he was rich. His wealth was his opportunity to bridge the gulf that separated him from his brother Lazarus… Dives went to hell because he sought to be a conscientious objector in the war against poverty… If America does not use her vast resources of wealth to end poverty and make it possible for all of God's children to have the basic necessities of life, she too will go to hell (Carson 354).

In his support of striking workers and of the Poor People's Campaign, seen especially clearly in this biting rebuke of American

greed, King was beginning to look more like Rauschenbusch in his focus on class division.

In spite of King's criticisms of Rauschenbusch and the social gospel, he is deeply theologically ensconced in that line of reasoning, if not in the movement itself. The two took similar theological journeys, starting from similar upbringings and family life. Judging from King's final undertakings, he felt perhaps as deep a concern regarding the problem of class as did Rauschenbusch. Both held firm to their pacifist beliefs in the face of public ridicule. If Rauschenbusch did not speak out sufficiently on the issue of race, perhaps he might have behaved differently had he lived in the 1950s or 60s. His comments encouraging African Americans to nonviolent protest suggest that he and King held similar understandings of effective methods of bringing about social change. If Rauschenbusch had lived in the era of Civil Rights, it seems clear that he would have supported King's efforts.

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Assessment of the Desiccation of the Aral Sea: Impact on Water and Soil Quality, Biodiversity, Climate, and Human Health in the Aral Sea Basin

James Randolph

The desiccation of the Aral Sea has adversely affected the water and soil quality, biodiversity, climate, and human health of the Aral Sea basin. Triggered by the Soviet construction of an enormous irrigation network in Central Asia to support cotton cultivation, the recession of the Aral Sea has transformed the region's ecological balance. Salinity of soil and water has increased, while water shortages have plagued the area. The extinction of fish and bird species and the decline of mammal populations have caused a tremendous loss of biodiversity in the region. Furthermore, the climate of the Aral Sea basin has become harsher due to a decreased lake effect, and human health has suffered with an increased prevalence of infectious and chronic diseases. These severe repercussions of the recession of the Aral Sea are directly attributable to water mismanagement on an astounding scale.

Until the 1960s, the Aral Sea was the fourth largest lake in the world, behind the Caspian Sea, Lake Superior, and Lake Victoria (Spoor 1998). It contained more than 800 million acre-feet of water and covered an area approximately the combined size of the Netherlands and Belgium (Pearce 2006). Today, however, the Aral Sea has split into three sections: the Little Aral, the Large Aral West, and the Large Aral East. In 1960, the water level was approximately 53 m above sea level, but by 2006, it had fallen to 30 m above sea level (Glantz 2007). Furthermore, since 1960, the Aral Sea has lost approximately 80% of its volume and 60% of its surface area (E.E. Small et al. 2001), while the shoreline has retreated as far as 120 km (Jackson et al. 2001).

Located between the Karakum and Kyzlkum deserts in Central Asia, the Aral Sea is fed chiefly by the Amu Darya and the Syr Darya rivers. The Amu Darya River, **2540 km** in length, originates in the Pamir Mountains of southern Tajikistan and northern Afghanistan; the Syr Darya River, **2205 km** in length, originates in

the Tien Shan glaciers of Kyrgyzstan (Spoor 1998).

The Aral Sea basin contains approximately 2 million km^2 in five nations once part of the former Soviet Union: Kazakhstan, Kirghizstan, Tadzhikistan, Turkmenistan, and Uzbekistan (Glazovsky 1995).

The Soviet government viewed the Aral Sea basin as a prime location for cultivating cotton due to the region's ideal soil and climate conditions, with the exception of insufficient rainfall. The Soviets, therefore, developed an extensive program to channel water from the Amu Darya and Syr Darya rivers into irrigation canals. Work on the largest canal, the Karakum Canal, began in 1954 (Waltham and Sholji 2001). Stretching 1287 km across the desert of Turkmenistan, the Karakum Canal is the longest irrigation canal in the world. Since its construction, it has diverted nearly 400 million acre-feet of water from the Amu Darya. Consequently, by 1990, the canal had slashed the inflow of the Amu Darya into the Aral Sea by 90% (Pearce 2006). The Karakum Canal, however, is only the most conspicuous part of the region's massive, but flawed, irrigation system. From 1960 to 2000, the amount of irrigated land in the Aral Sea basin nearly doubled, from 4,510,000 ha to 7,853,000 ha (Severskiy 2004). The gross inefficiency of the irrigation system exacerbates the loss of water. Of the total length (47,700 km) of irrigation canals, 34,200 km are unlined, resulting in a high degree of seepage (Spoor and Krutov 2003). Since the canals are uncovered, much water is lost through evaporation as well. Poor drainage systems compound water loss even further (Waltham and Sholji 2001). The modification of river flow, according to estimates by the Global International Waters Assessment (GIWA) program, is responsible for approximately 70% of the environmental degradation in the region, with pollution of water supplies accounting for the remaining 30% (Severskiy 2004).

The recession of the Aral Sea due to reduction of stream flow has exposed over 40,000 km^2 of the former sea floor (Waltham and Sholji 2001). Much of the former seabed is covered with salt, including calcium sulfate, calcium carbonate, sodium chloride, magnesium chloride, and sodium sulfate (Micklin 1988). Due to this desertification, an estimated 1.5-6.5 tons of particles

from each hectare of exposed seabed are blown away annually by windstorms that occur three months of the year. Of these particles, approximately 260-1000 kg/ha are toxic salts (Spoor and Krutov 2003). Consequently, the storms carry approximately 10^8 metric tons of a toxic dust-salt mixture from the exposed seabed to surrounding land each year (Postel 2000). These toxic windstorms intensify soil degradation, decrease crop yields, and worsen human health (Spoor 1998).

The desiccation of the Aral Sea has triggered water shortages throughout the basin as well (Severskiy 2004). Ongoing reliance on a water-intensive crop such as cotton only exacerbates water shortages. The five nations in the Aral Sea basin hold five of the top seven positions in the world league table of per capita water users. Notably, Turkmenistan and Uzbekistan, the two nations which use water from the Amu Darya, consume more water per capita than any other country on earth (Pearce 2006). Due to reuse of return water, water usage amounts to 100-110% in the Amu Darya basin and 130-150% in the Syr Darya basin (Severskiy 2004). Furthermore, diversion of water for irrigation has led to shortages in the drinking water supply; for example, two-thirds of the water pumps installed by the World Bank have gone dry in Karakalpakstan, a republic in the Amu Darya delta in Uzbekistan (Pearce 2006).

With the shrinking of the Aral Sea, the salinity of its water has increased. The salinity of the Aral Sea was once 1% (about 25% of the salinity of ocean water), but it increased to 6% by 2001 (Waltham and Sholji 2001). The salinity of groundwater has also increased, with levels ranging from 0.5 g/L total dissolved salts (TDS) to 6 g/L TDS, a value 20 times higher than groundwater salinity in North America (I. Small et al. 2001). River water salinity is attributed to irrigation water that is discharged into the rivers from drainage systems. As a result, the total salt amount in the rivers rose from 55-60 million tons in the 1960s to 135-140 million tons in the 1990s. Downstream locations have higher salinity levels than upstream areas. In the upper regions of both the Amu Darya and Syr Darya, salinity levels average 0.45-0.60 g/L TDS; salinity levels in the southern Amu Darya near the Aral Sea reach

1 g/L TDS, while salinity levels in downstream regions of the Syr Darya average 1.41 g/L TDS (Spoor and Krutov 2003).

Due to the extensive degradation of water quality, many people living in the Aral Sea basin lack access to clean drinking water. In Uzbekistan, only 2.3% of the population has access to clean water. Mineralization of river water in Karakalpakstan has increased to 2.5-2.8 g/L TDS, making it unsuitable for drinking (Severskiy 2004). Drinking water in the Aral Sea basin even reaches levels up to 3.5 g/L TDS (I. Small et al. 2001). Approximately 90% of the rural population acquires a spring and summer water supply from irrigation networks (Glazovsky 1995). In addition to salt, irrigation water contains pathogenic microorganisms and intestinal bacillus in quantities significantly higher than maximum permissible levels (Spoor 1998). Results of water quality studies of the Aral Sea basin published by the GIWA in 2004 indicated that approximately 8% of the water was categorized as very polluted, 44% as moderately polluted, 23% as slightly polluted, and 25% as bordering between satisfactory and unsatisfactory (Severskiy 2004).

Salinity has resulted in severe soil degradation as well. Since the same fields have been irrigated for decades without proper drainage or crop rotation, waterlogging of the soil has occurred, resulting in the upward flow of minerals (Spoor and Krutov 2003). Farmers, thus, must flush out the salt that has accumulated on their lands, but, in doing so, they add more salt to the soil; if the practice of using salt water to combat soil salinization continues, large areas of the Aral Sea basin will not support agriculture in a few decades (Spoor 1998). Due to poor irrigation and agricultural practices, about 50% of land in the Aral Sea basin is categorized as saline, but the extent of the problem varies. Less than 10% of the soil in the upstream reaches of the basin has average or strong salinity, while more than 95% of the land in downstream regions is saline (Kindler 1998).

Another soil-quality issue involves pollution associated with agricultural production. With a cotton monoculture, large amounts of pesticides, fertilizers, defoliants, and herbicides were applied in the fields. Up to 54 kg/ha of pesticides were used in the

region in the 1990s, compared with a mean value of 3 kg/ha in the former Soviet Union. In the 1990s, sampling stations along the entire length of the Amu Darya and Syr Darya recorded levels of organochlorine pesticides, some of which exceeded the maximum permissible concentration (MPC). Dichloro-diphenyl-trichloroethane (DDT) was widely used until 1982. As a result, the DDT content in soil in almost all regions of the basin reaches levels approximately 27 times higher than the MPC; in some areas it exceeds 46 times the MPC (Glazovsky 1995).

The desiccation and increased water salinity have devastated aquatic life, leading to the virtual disappearance of the region's once-vibrant fishing industry. All 24 native fish species in the Aral Sea have died out (Postel 2000); the last indigenous fish species became extinct in 1985 (Waltham and Sholji 2001). Many haloplankton and almost all limnoplankton in the Aral Sea are also extinct (Glazovsky 1995). The average zooplankton level has fallen from 160 g/m^3 to 15 g/m^3 (Kindler 1998). In the 1950s, fishermen caught 48,000 tons of fish annually, namely sturgeon (*Acipenseridae ruthenus)*, carp (*Cyprinus carpio)*, and bream (*Abramis brama)* (Pearce 2006). In Kazakhstan alone, the fishing industry generated 61,000 jobs, but by the mid 1990s, it employed only 1800 people (Glazovsky 1995). The collapse of the fishing industry has dramatically reduced the population of cities and villages. The city of Muynak, for example, had a population of over 40,000 in the 1960s and boasted the largest fish-processing factory in the Soviet Union (Pearce 2006). At that time, Muynak was a port on the Aral Sea, but with the recession of the sea, it is now more than 100 km from the Aral (I. Small et al. 2001). In 2006, Muynak's population hovered around 10,000, while the fish-processing factory lay virtually abandoned (Pearce 2006).

The reduction of river flow into the Aral Sea, together with the increased water salinity, has also crippled the once-bountiful deltas of the Amu Darya and Syr Darya (Spoor and Krutov 2003). The deltas experienced ecological damage soon after the massive irrigation initiative began, as 11 of the 25 largest lakes in the Amu Darya delta vanished between 1960 and 1980, and the area of natural lakes in the Syr Darya delta dropped from 500 km^2 in 1960 to

just a few tens of square kilometers by 1974 (Micklin 1988). Overall, wetlands in the deltas have declined by 85% since 1960 (Postel 2000). An estimated 30,000 ha of bogs and lakes in the Amu Darya delta alone have disappeared (Spoor and Krutov 2003).

As marshes and freshwater lakes in the deltas have receded, they have been replaced by salt deserts (Kindler 1998). Reed thickets have markedly diminished, causing reed harvests to fall from 34 tonnes/ha to 0.007-0.13 tonnes/ha by the mid 1980s (Glazovsky 1995). The delta's tugay forests, comprised of a mix of strands of phreatophytes, tall grasses, and shrubs, have experienced an immense decline. By 1980, the expanse of the tugay had been reduced to about 6500 km^2, half of its size in the 1950s (Micklin 1988). Moss replaced the tugay, which was in turn replaced by turang grasses. The environmental degradation also extends to the upper basin, where approximately 50% of forest cover has perished (Kindler 1998). Glazovsky (1995) reported that the number of mammal species in the basin had declined from 70 to 30, a trend that has likely continued. The muskrat (*Ondatra zibethicus)* population has fallen precipitously, with less than 1000 remaining in 2006 (Pearce 2006). The number of nesting bird species has also declined in the Syr Darya delta from an estimated 173 to 38 (Postel 2000). With such ecological damage, an estimated one-fifth of the human population has left the Amu Darya delta (Pearce 2006).

The recession of the Aral Sea has triggered a regional climate change. Previously, the tremendous size of the Aral Sea helped to moderate the desert conditions (Pearce 2006). With the decrease in water depth and the associated reduction in thermal capacity, the Aral Sea now exhibits a diminished lake effect. As a result, springs and summers have become warmer, while falls and winters have become cooler. In an analysis of climate records of the region from 1960 to 1997, E.E. Small et al. (2001) identified climate changes and then isolated those changes caused by the sea's desiccation from climate changes caused by other factors. The study concluded that the maximum, minimum, and mean surface air temperatures have altered by as much as 6°C near the

Aral Sea. Furthermore, although the most substantial temperature changes have occurred nearest the Aral Sea and diminish with increasing distance from the sea, climate changes have extended as far as approximately 200 km from the 1960 shoreline (E.E. Small et al. 2001). Humidity along the coast has decreased by 23%, and drought instances have increased by 300%. Spring now begins 7 days later, and fall begins 12-13 days later. The annual precipitation cycle has changed as well. In 1959, minimum precipitation occurred in September, while maximum precipitation occurred in February and March. From 1970-1979, however, minimum precipitation fell in July, while the maximum fell in April. The retreating shoreline has also caused a sevenfold increase in albedo, leading to a tripling in the amount of reflected solar radiation (Glazovsky 1995).

Climate changes have altered agricultural productivity of the Aral Sea basin, for the decline in the number of frost-free days has shortened the planting season (Spoor and Krutov 2003). In response, many farmers in the deltas have shifted their production from cotton to rice, a crop that requires even more water than cotton (Spoor 1998). The modification of stream flow has impaired agriculture throughout the basin as well. According to Spoor and Krutov (2003), high soil salinity can reduce crop yields by 10-50%. An estimated 30-66% of irrigated fields in the basin have been polluted, leading to agricultural product losses ranging from 20% in Kyrgyzstan and Tajikistan to 30% in Uzbekistan (Severskiy 2004). Agriculture, however, continues to dominate the economy of the Aral Sea basin, with irrigated farming comprising 50% of the gross domestic product (GDP) (Severskiy 2004).

The environmental crisis surrounding the desiccation of the Aral Sea has caused immense suffering for the 5 million people living in the region who must contend with such factors as dust storms, salinization of the water table, and the spread of pesticides through the food chain and environment (I. Small et al. 2001). As Waltham and Sholji (2001) noted, ill health affects approximately two-thirds of the people in the area. Residents of the Aral Sea basin face increased risk of respiratory conditions, hypertension, various cancers, heart disease, and kidney disease. Prolonged

exposure to high levels of organic pollutants is also suspected of adversely affecting the maternal-fetal interface through potential endocrine disruption, teratogenesis, and behavioral and neurodevelopmental complications. The gravest concern, however, centers on the high incidence and prevalence of hepatitis, tuberculosis, respiratory ailments, and diarrheal diseases. Compounding this health crisis, hospitals and other health care facilities lack vital medicines and equipment. Furthermore, increased instances of mental illness have been noted; a 1999 study by Medecins Sans Frontieres indicated that approximately one-half of the population reported somatic symptoms related to emotional stress (I. Small et al. 2001).

The suffering of the people of Karakalpakstan illustrates the human cost of the Aral Sea disaster. Approximately 1 in 20 babies in Karakalpakstan is born with a birth defect, most commonly affecting the hands, legs, and mouth, while infant mortality is 75 per 1000 births. Anemia affects 97% of women and 87% of newborns. The rates of kidney and liver diseases, allergies, immunological disorders, and reproductive pathologies are exceptionally high; the rate of esophageal cancer is the highest in the world. From the early 1990s until 2006, life expectancy in Karakalpakstan fell from 64 to 51 years (Pearce 2006).

Childhood respiratory problems rank as one of the most pressing health issues facing the Aral Sea basin. These ailments are attributed to the effects of airborne dust contaminated with organophosphate phosalone, a pesticide formerly used widely in the region. The Uzbek government has estimated that childhood pneumonia rates in Karakalpakstan are the highest in the former Soviet Union. In Turkmenistan, approximately 50% of all reported childhood illnesses are respiratory in nature. The appearance of interstitial lung disease among children has also been noted in regions of Kazakhstan bordering the Aral Sea (O'Hara et al. 2000).

The environmental crisis in the basin has affected food safety as well. Pesticides have penetrated the food chain through fodder and water, with the result that 37% of food products contain pesticides (Glazovksy 1995). Research conducted by Muntean et al. (2003) on 12 foods commonly grown, purchased, and eaten in

Karakalpakstan revealed evidence of toxic contaminants, most disturbingly the highly toxic 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD). Foods with high lipid content were determined to have the greatest level of contamination, with sheep fat, chicken fat, cottonseed oil, and eggs having dioxin levels exceeding international intake standards. The study also found that cottonseed oil contained the highest toxicity from polychlorinated biphenyls (PCBs) of any food of plant origin tested. In collecting and analyzing samples, researchers followed sampling instructions set by the Codex Alimentarius Commission. Furthermore, the study by Muntean et al. (2003) determined that the average citizen of Karakalpakstan was exposed to dietary dioxin levels that were nearly triple the maximum level considered safe by the World Health Organization.

In assessing the future of the Aral Sea basin, hope for sustainability exists for the Small Aral Sea, but the Large Aral Sea faces much bleaker prospects. The government of Kazakhstan partnered with the World Bank to construct an $85 million dam to retain water in the Small Aral Sea. Slowly, the Small Aral Sea is being refilled and is even projected to slightly expand in coming years (Conant 2006). In order for the Large Aral Sea to survive, it must receive an annual inflow of 28^3 km from the Amu Darya, but achieving this goal would entail drastic changes that appear beyond the capacity of Central Asian governments. Thus, given current conditions, the Large Aral West will continue to recede and eventually become either a salt flat or saline pond. The future of the Large Aral East is slightly more promising, for it may become sustainable if it receives overflow from the Small Aral Sea coupled with some inflow from the Amu Darya (Waltham and Sholji 2001).

The Aral Sea disaster serves as a warning regarding attempts to disregard ecological realities in order to achieve shortsighted ends. As a result of Soviet irrigation projects, the Aral Sea basin has experienced soil and water pollution, water shortages, a harsher climate, worsened human health, economic hardship, and reduced biodiversity. The Aral Sea itself has splintered into three smaller lakes and a maze of irrigation canals. Indeed, analysis of the environmental ramifications of the desiccation of the Aral Sea

conveys the necessity that humanity respect our planet.

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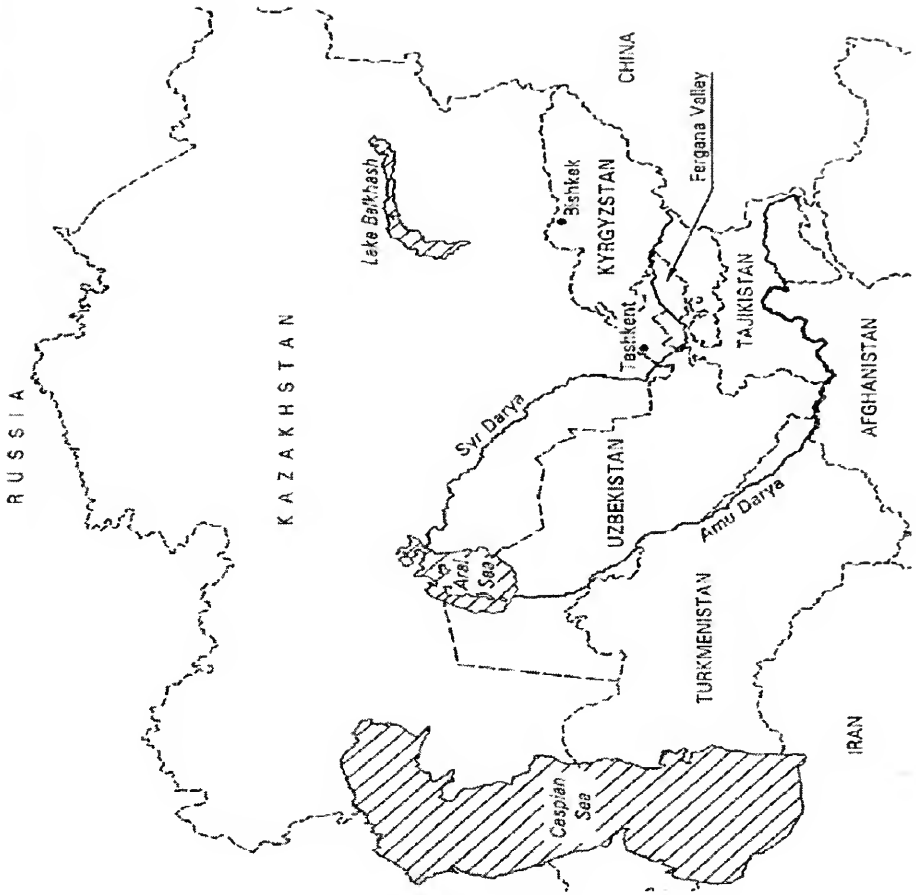
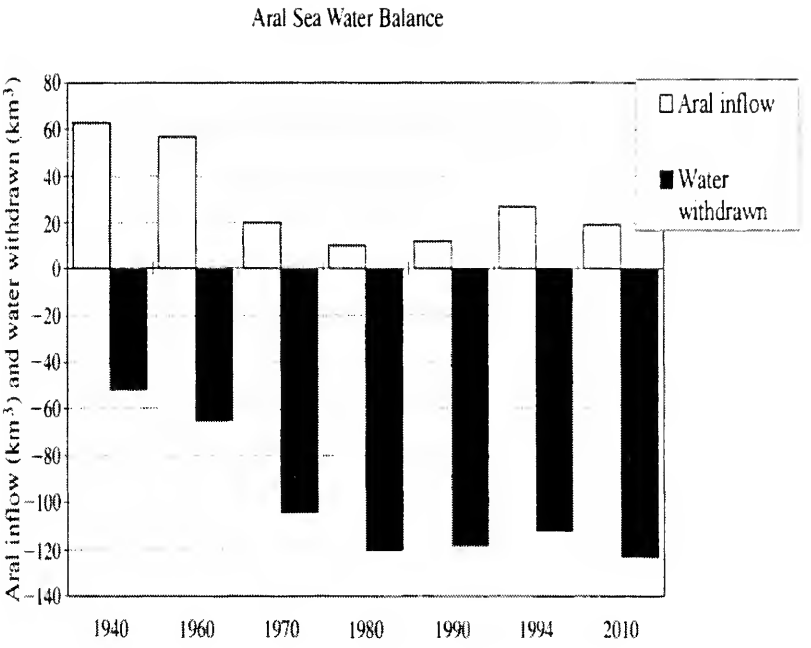


Source: Spoor, M., and A. Krutov. 2003. "The 'power of water' in a divided Central Asia." *Perspectives on Global Development and Technology* **2**: 594.

The Chronology of Desiccation of the Aral Sea (1960-2010)

Year		Average level (m)	Average area (km^2)	Average volume (km^3)	Average salinity (g/l)
1960		53.4	66,900	1,090	10
1971		51.1	60,200	925	11
1976		48.3	55,700	763	14
1980		45.4	–	602	–
1985		41.5	45,713	468	–
1988		40.1	–	358	–
1990			36,500	330	
	large sea	38.6	33,500	310	~30
	small sea	39.5	3,000	20	~30
1993		37.1	33,642	300	
	large sea	36.9	30,953	279	~37
	small sea	39.9	2,689	21	~30
1998		34.8	28,687	181	~45
1999*			25,600	187	
	large sea	33.4	22,800	168	39
	small sea	39.4	2,700	19	18
2000*			24,003	173	
	large sea	32.5	21,200	149	67
	small sea	38.6	2,700	17	18
2010	(Scenario)	32.4	21,058	~124	~70

Source: Spoor, M., and A. Krutov. 2003. "The 'power of water' in a divided Central Asia." *Perspectives on Global Development and Technology* **2**: 598.



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Industry, Competitive, and Situational Analyses: Mattel Corporation and the Global Leisure Products Industry

Susan Fant

Economic Features of the Industry

The global leisure products industry focuses on the use of consumer discretionary funds. According to the Datamonitor industry profile, "the global leisure products market consists of the total revenues generated through the sale of computer and video game software, traditional toys and games, bicycles and sporting equipment" (Datamonitor Industry Profile 6). The industry made 155.8 billion dollars in 2006. Specifically toys and games, Mattel's specialty, made 61.5 billion dollars, which makes up 39.5% of the market's overall value (Datamonitor Global Leisure Products Industry Profile 6). The industry itself has garnered disposable income due to the "spending culture" within the worldwide retail market. Datamonitor's industry report predicts this "spending culture" will continue to accelerate over time and the value should be worth "181.2 billion dollars by the end of 2011" ("Datamonitor Global Leisure Products Industry Profile 7).

The toys and games section of the industry is "highly concentrated: the top 50 companies hold 75 percent of the market (Hoover's Industry Profile 1). The leisure industry, as a whole, has several main companies that dominate the market. The three leading companies are the following: Sony Corporation, Mattel, and Hasbro (Datamonitor Industry Profile 13). The companies' main world regions of interest have been the United States and Asia-Pacific. These countries have generated 34.9% and 31.8% respectively of the market value in 2006 (Datamonitor Global Leisure Products Industry Profile 7). Asia-Pacific is thought to be the most progressive market, noted to expand rapidly and be the most profitable of all the regions in the world (Datamonitor Global Leisure Products Industry Profile 7).

The companies in this market sell directly to intermediary sellers, such as Wal-Mart, Toys R Us, and Target. Wal-Mart holds

20% of the market as the number one toy seller (Hoover's Industry Report 1). Parents usually spend the discretionary funds to purchase toys. The amount of purchases may continue to rise because of the following reasoning:

> Demographic and socioeconomic trends are influencing the market: declining levels of debt, and growth in divorces ensures an increase in the amount of parents "guilt-buying" gifts for their children. Parents who choose to have only one child as many do, have greater financial resources to spend on their child, benefiting the higher end of the market (Datamonitor Industry Review 12).

Companies may also consider families with two homes, who buy identical toys, as well as the increase in both male and female parents working and spending less time with their children. This guilt buying, based on societal measures, standards, and mores, allows companies to expand product lines to focus on both toys that add educational content as well as more interactive toys, or toys that play with the child instead of the child playing with the toy or requiring that someone play with the toy and the child (Datamonitor Industry Review 12).

Product innovation focuses on garnering the interest of children early. The phenomena of children getting older younger proves to be a challenge for all companies in the industry (International Council of Toy Industries 12). According to Hoover's industry annalist, Catherine Colbert, "The population growth of young children drives demand. The profitability of individual companies depends on identifying market trends and marketing effectively" (Colbert 1). The "tween" market, which is comprised of children from seven to fourteen years old, has also been in focus for companies. For example, young girls are giving up Mattel's Barbie doll at an earlier age "in search of more self-defining items like jewelry kits or customized bedroom accessories" (Colbert 1).

Companies are focusing on creating the following types of products: "the next big hit," technology toys, educational toys, and retro toys (Colbert 1). The "next big hit" products are products like Mattel's Tickle Me Elmo, which is already thought to reach shortages (Kavilanz 1). Technology toys, also known as "chip driven toys" are products like "FurReal Friends by Hasbro's Tiger Elec-

tronics" (Colbert 1). Educational toys are products like the "LeapPad" by LeapFrog Enterprises that interactively teaches children all subjects, from math to writing. Retro toys are products reintroduced into the marketplace. Consumers on a nostalgia kick buy products such as Care Bares and Strawberry Shortcake, made popular in the 1980s (Colbert 1).

Being able to be the "first-to-market" with a product can differentiate companies. However, one of the best approaches may be more expansion into international markets. Colbert notes, "Toy makers have historically targeted American children who on average acquire 400 million dollars of toys each year...India for example has 400 million potential toy consumers and China has 300 million children. In the future, successful suppliers...may have to attract the attention of children around the world" (Colbert 2).

Key players in the industry do use the amount they supply to an advantage in the United States. It has become a common practice for "next big hit" products to be short supplied in order to create a sellers market. Products such as Mattel's Tickle Me Elmo sell out quickly, creating a secondary market on auction websites such as E-bay (Kavilanz 1). This relates to technological advances as well. One reason the Tickle Me Elmo line is so popular is that it uses technology to interact with children. When the child touches the red, furry doll it falls to the ground and begins to laugh uncontrollably (Kavilanz 1). Technological advances are highly important in this industry. Hoover's reports, "As children gravitate toward video games and consumer electronics at younger ages, toy manufacturers have integrated computers into traditional toys to improve play value and remain competitive" (Hoover's Industry Profile 1).

Although categorized in the same industry, the consumer electronics offered by leading company Sony is in direct rivalry with the toys offered by Mattel and Hasbro. Mattel and Hasbro continuous focus on technology in order to compete with DVDs and video games provided by Sony (Standard and Poor's Sony Stock Report 1). Hoover's reports, "traditional games like "Candyland" and "Twister" have DVD versions and some companies offer children's versions of popular consumer electronics like digital cameras and DVD players" (Hoover's Industry Profile 1). The

Internet is also used as a medium of interaction between children and their toys. Different product lines incorporate websites to host "story lines, bios, screensavers, and games" (Colbert 2). Colbert adds, "Companies such as Neopets have taken an online virtual pet community and grown the entity into a variety of merchandising wares in the form of plush toys, stationery items, clothing and accessories and a card game" (Colbert 2).

Most toy manufacturing takes place outside of the United States, in countries such as China or Mexico. There are several different processes to manufacture an average toy, the most common include: blow molding, injection molding, die-casting, spray-painting, printing, sewing, assembling and hand painting. Blow and injection molding uses air pressure to force heated plastic into molds and die-casting molds heated metal into models (Hoover's Industry Profile 1). The manufacturing process focuses on garnering raw materials and then using different vendors to assemble, dress, and package the products (Hoover's Industry Profile 1). Major raw materials in the process include the following: "toy components, plastic, resins, paperboard, fabricated metal, zinc alloy, and oil-based resin" (Hoover's Industry Profile 1). Mass production is important to the industry, as many key companies like Mattel and Hasbro tend to place orders a year in advance in order to meet consumer demand (Hoover's Industry Profile 1).

The Five Forces Model of Competition

The major competitive forces and rivalry includes firms in other industries, rivalry among competing sellers, potential new entrants, suppliers and buyers (Thomas, Strickland and Gamble 55). Firms from other industries continue to be a threat to this industry when they offer competing products. Some analyses refuse to put electronic toys and non-electronic toys together in an industry. However, with the surge toward technologically advanced toys that gap is slowly closing. Major companies such as Mattel and Hasbro still have not developed a product to directly compete with products such as Nintendo's Wii (Richtel 1). Standard and Poor's notes, "traditional toy companies now also face competition with

the entertainment offerings of other companies, such as the makers of video games and other consumer electronic products" (Hasbro Stock Report 3).

This is where the main competition between Sony Corporation, Mattel and Hasbro comes directly into play. Sony Corporation's main profit comes from its business in electronics. According to Standard and Poor's, "the electronics business made up 73% of total sales in FY 07 (Mar)" (Sony Stock Report 2). Sony's most competitive products with Mattel and Hasbro are video games and DVDs. According to Standard and Poor's,

> The game business designs, develops, and sells PlayStation 2, PlayStation 3, and PlayStation Portable game consoles and related software mainly in Japan, the U.S.; manufactures semiconductors used in the game consoles in Japan and licenses to third-party software developers. Sales in the game segment depend on holiday season demand, and on the timing of the introduction of software...The picture business encompasses motion picture production, acquisition and distribution; programming, syndication, acquisition, distribution, and broadcasting; home video acquisition and distribution; and the operation of studio facilities, including Columbia TriStar Motion Picture Group and Sony Pictures Studio (Sony Stock Report 2).

Sony works more towards vertical integration and keeping more steps of the process to a complete product within the company and under their direct control (Sony Stock Report 2). Mattel and Hasbro commission more work to other companies (Hoover's Industry Profile).

Other competition comes from the children's publishing industry. The global publishing industry commanded 444,067.3 million dollars in revenues in 2007. Books made up 28.1% of the market share within the industry (Datamonitor Global Publishing Industry Report 7, 10). However, toy companies have responded with the continued output of educational toys. LeapFrog Enterprises specifically focuses product lines on educational standards. The product line includes toys that focus on developing reading,

writing, math, and geography skills (Hoover's Industry Review 2).

There are few potential new entrants into the industry. According to Hoover's, "the industry is highly concentrated: the top 50 companies hold 75 percent of the market" (Hoover's Industry Profile 1). However, Raw material supplies affect the industry's prices as well as production schedules. Datamonitor notes, "another development currently affecting the market is the spiraling price of crude oil that continues to detract from margins by way of increasing raw material, transportation, and energy costs" (Datamonitor Global Leisure Products 11).

The high concentration of buyers is important to companies because the companies run the risk of loosing a bargaining position. The main toy buyers are Wal-Mart, Target, and Toys R Us (Mattel Stock Report 2). For example, "[in regards to Mattel] collectively the top ten customers accounted for 52% of 2006 sales (Mattel Stock Report 2). In regards to Hasbro, "the top five customers accounted for 53% of sales (Hasbro Stock Report 3). According to both these Standard and Poor's stock reports the risk is highest for both these leading companies in the industry because they cannot bargain their prices as well as possible. Hasbro may suffer from this more given that five customers make up nearly half of revenue versus Mattel's ten customers that make up half of revenue (Mattel and Hasbro Stock Reports 2,3).

Forces Driving Change and the Impact of Change

Given the international reach and increasing globalization of the leading companies in the industry, fluctuations in currency make the companies susceptible. According to Datamonitor, "the current weak status of the US dollar has detracted from the global market's revenues in recent year as companies based outside the country, particularly in Asia-Pacific, have converted revenues into their home currencies" (Datamonitor Industry Report 11). Asia-Pacific plays a large role in the marketplace, "for instance, leading companies within Asia-Pacific have started to shift their focus away from the steady growth of the US market towards the emerging markets of Asia-Pacific, allowing them to exploit the region's

rapid growth rates" (Datamonitor Industry Report 11).

Innovation plays a key role in the industry. Online consumers play a key role by demanding growth for technologically savvy products and educational products (Datamonitor Industry Report 7). Licensing has proven to play a role in the innovation process as well. Putting together toys that are different than other, but that use characters that resonate with children allows for companies to market to children new products that they can recognize. Licensing has allowed companies to use major children's characters, from movies, television, and books to be used in products (Hoover's Industry Report 2). For example, "Well-known licenses include Winnie-the-Pooh, Sesame Street, and Batman. Companies may also license product concepts or designs from independent toy and game designers. In addition, companies may license characters developed in-house to other companies for promotions, like using Hot-Wheels for McDonald's Happy Meal toys" (Hoover's Industry Report 2). Licensing, however, can prove to be difficult, for example "Hasbro paid some $600 million and 20% royalty for rights to the second series of Star Wars movies, only to be stuck with unsold inventory" (Colbert 2).

The most recent driving force in the industry is the move toward changing the manufacturing process. In the month of January, the *Financial Times* reported that Hasbro Chairman, Alan Hassenfeld, asked for one standard to be set for manufacturing throughout the world. This is in regards to the previous recalls of toys due to high levels of lead paint used in Chinese manufacturing plants. However, the *Financial Times* reports, "China-based toy manufacturers account for more than 70 percent of global production. According to customs data, China exported more than $7.8 billion in toys in the first 11 months of last year, up from just under $7.1 billion in all of 2006 (Mitchell 1).

A Harris Interactive Poll, taken by the International Council of Toy Industries, notes, "Overall, awareness of recent toy recalls is very high in the U.S., with nine-in-ten (91%) saying they have heard about the issue. However, while awareness is high, the percentage of the population who believe they have a recalled toy in their home is low and the percentage who report doing something

about it is even smaller" (The Harris Poll 1). Hassenfield also noted, "most of the toy industry had supply chains that survived the storm...but publicity over the recalls has also prompted change in the industry...there has been a huge increase in testing and awareness (Mitchell 1). Due to the recalls, "the US toy industry has responded with a blitz of information aimed at reassuring consumers – including a special toy safety website launched by the Toy Industry Association that argues the recalls are a sign the toy safety monitoring is working" (Birchall 1).

Industry Rivals' Market Position and Strategic Groups

Mattel is the largest toy company in the industry (Hoover's Industry Profile 1). Key companies in the industry are the following: Mattel, Hasbro, Namco Bandai, LEGO, Sammy Corporation, Sanrio, Ty, LeapFrog, and Sony Corporation (Colbert 2). Many of these companies compete together and are based in similar pricing ranges. Mattel, Hasbro, LEGO, and Sony are well known in global arena, whereas LeapFrog and Ty are known specifically in the United States and Sanrio specifically in Asia (Colbert 2). Mattel, Hasbro, LEGO and Sony are well positioned on this scale because they draw from a larger customer base and have the same competitive pricing as other companies in the field. However, since the brands are well known, like Barbie, Hot Wheels and PlayStation these leading companies attract higher revenues (Colbert 2).

Rivals' Strategic Moves

Hasbro nips at the heels of Mattel's market share. Hasbro is known for brands such as "Playskool, Tonka, Super Soaker, Milton Bradley, Parker Brothers, Tiger and Wizards of the Coast (Hasbro Stock Report 3). Currently, Hasbro's main strategy has focused on licensing. Even though Hasbro proved to not be as successful with licensing with Star Wars, as discussed previously, the company continues to licenses with Lucasfilm. The licensing represents 16% of the total company revenues. In 2006, Hasbro signed a deal with Marvel Entertainment for the rights to Spiderman and the Fantastic

4 (Hasbro Stock Report 3). In 2006 the company's revenues reached 3,838 million dollars (Hasbro Stock Report 2). Currently, Hasbro has also focused on keeping up with technology and competing with consumer electronics (Hasbro Stock Report 3).

Sony Corporation focuses on keeping up with its many different industries. Competing in many industries diversifies the company's product lines, but also weakens the company in the same right though being able to funnel fewer resources into one area. Sony Corporation's focus on video games and DVDs continues to be less of a priority both only garnering 12% of yearly revenue (Sony Stock Report 2). However, Sony's use of vertical integration especially in the motion picture production category allows for more control over prices. Columbia TriStar Motion Picture group and Sony Pictures Studio, both owned by Sony are in direct competition for the discretionary dollars that the industry companies are fighting to gain (Sony Stock Report 2).

Key Success Factors for Future Competitive Success

Key success factors for the companies continue to be improvements in technology and cutting the costs of raw materials and transportation (Hoover's Industry Profile 2). Streamlining the manufacturing process by regulated safety standards may also cut costs and improve productivity (Mitchell 1).

Also noteworthy, is attracting key consumers. Even though Wal-Mart, Target and Toys R Us make up the largest percentage of customers, the companies can focus to appeal directly to the consumer. The following information is from the Toy Industry Association:

> About one-third of American adults are grandparents. There are currently 70 million of them in the U.S. And with Baby Boomers now approaching grandparent age, this number is expected to swell to over 115 million by 2010. As a group, American grandparents spend more than $30 billion a year on their grandkids, a two-fold increase over what was spent a decade ago. Grandparents represent 15% - 25% of the annual toy dollars spent, depending busi

on the individual toy category. Grandparent purchases are a significant factor in the United States, representing between $3.5 Billion- $4 Billion dollars annually for purchases of toys and games; the entire annual traditional toys business in the USA represented $22.3 Billion market in 2006 (Source: The NPD Group, Inc.) (Rice 1).

The Baby Boomer generation plays a key role in buying these products from the three main stores, Wal-Mart, Target, and Toys R Us. These customers dominate the market and the trends and what they find as acceptable gifts for their grand children and as gifts for other children.

Also important, is the way companies market to all age groups. More than just children are consumers of toys. For example, "A Holiday 2006 wish-list study revealed 52% of grandparents and 68% of Baby Boomers had consumer electronics products on their own wish lists…it was the Boomers' love of music that exploded the trend in video game sales for Guitar Hero I and II (Red Octane Games), which were found to be just as popular with Baby Boomers as they were for teens and young adults" (Rice 2). This has also been the case for the Nintendo Wii (Richtel 2). More adults are consuming leisure products in this industry. They key will be learning how to market non-electronic toys, such as board games to this market. Currently a trend in the industry is to market retro games that are refurbished to look like they originally did during their debut or games that are easy to play and involve all ages (Colbert 2).

Future Profitability of the Industry

The profitability of the entire industry looks optimistic. Even though many recalls took place in 2007, the industry has still survived and consumers are still buying painted toys manufactured in China (The Harris Poll 1). Many brands in the industry have a long history. Barbie, for instance, was created in 1959 and still is produced in mass quantity today.

The industry must continue to react to consumer demands. A new trend forming in the market place is "environmental

toys" or toys that are made from recycled material (Birchall 1). Mark Randall, who is in charge of toys and baby products for Amazon.com notes, "Two years ago I didn't hear anything about environmental sustainability issues. Now I think the industry is at the beginning of that change process" (Birchall 1). Many consumers are pushing for a move toward zero-chemicals used in toys. Amounts of lead, arsenic, and cadmium, although trace, produce a concern. Smaller, niche based companies like Haba, a German toy maker, focus on producing products specifically without lead paint that are green movement friendly.

The industry as a whole must focus on diversifying customer base, given that Wal-Mart, Target, and Toys R Us dominate any growth potential. These companies have control over the industry as to which toys are bought and sold (Hoover's Industry Report 2). According to Standard and Poor's, there is a sharp reduction of bargaining power and negotiation room when only three companies make up most of the revenue gains. Strong relationships with major customers may prove to be very important for every company in this industry in order to garner more store shelving space and more orders (Mattel Stock Report 2).

Mattel's Present Strategy

According to Standard and Poor's, "In 2006, Mattel commanded 13% of the market share in the U.S. toy industry, making it the largest U.S. toy manufacturer" (Mattel Stock Report). In comparison, Hasbro, a leading competitor only could claim 9% market share (Hasbro Stock Report 1). Mattel outperformed its industry by increasing its sales 4.1% (with a compounded annual growth rate) from 2002-2007. The following graph depicts this growth.

Past Growth Rate (%)	1 Year	3 Years	5 Years
Sales	9.10	4.14	2.94
Net Income	42.18	-0.24	9.04

(Source: Standard and Poor's Mattel Stock Report)

Analyses provide Mattel with an optimistic future. Sales growth is predicted to continue and possible margin expansion will cause Earnings Per Share growth in "high single digits over the long term (Mattel Stock Report 2). Also noted, was that Mattel is expected to "use free cash flow to invest in strategic acquisitions and to return funds to shareholders through dividends and share repurchases" (Mattel Stock Report 2). Below, ratio analyses are provided for both net profit margin and the subsequent return on equity.

Ratio Analysis (Annual Average)	1 Year	3 Years	5 Years
Net Margin (%)	10.49	9.92	9.98
Return on Equity	26.15	23.21	23.95

Source: Standard and Poor's Mattel Stock Report)

According to Datamonitor, "The company recorded revenues of $5,650.2 million during the fiscal year ended 2006, an increase of 9.1% over 2005. The operating profit of the company was $728.8 million during fiscal year 2006, an increase of 9.7% over 2005. The net profit was $592.9 million in fiscal year 2006, an increase of 42.2% over 2005" (Mattel, Inc. Company Profile 4).

Mattel's Strengths

Mattel has several major strengths. The main strength being

recognizable brands that have a history of success. Out of a garage, Harold Matson and Elliot Handler founded Mattel in 1945 (Mattel, Inc. Company Profile 6). In 1959, Barbie made her debut onto the marketplace soon followed by boyfriend, Ken in 1961. In 1993 the company merged with Fisher-Price, opening up a new section of products for pre-school children. Subsequent mergers included Tyco Toys, Pleasant Company, and Bandai (Mattel, Inc. Company Profile 6). Mattel has also entered into successful partnerships with ESPN, Shockwave.com, and Bonne Bell Cosmetics (Mattel, Inc. Company Profile 7). Mattel offers an extensive amount of products for pre-school children to older adults. These products include electronic and non-electronic toys, puzzles, action figures, dolls, and games. Datamonitor analysis notes, "Extensive product offering serves as a competitive advantage for the company as it provides cross selling opportunities to the company and caters to consumers of all ages which enable the company to spread its revenue base" (Mattel, Inc. Company Profile 23).

Mattel's international appeal also lends to its success. The company offers country-specific products. For example, Barbie dolls sold in India wear a sari and Barbie dolls sold in Indonesia are modestly dressed in cloaks and prayer dresses to represent the Muslim culture's prevalence in the country (Mattel, Inc. Company Profile 23). International sales made up 44% of gross sales in 2006 (Europe 56%, Latin America 27%, Asia Pacific 9%, Other 8%) (Mattel, Inc. Company Profile 23). Mattel also manufactures products in a wide variety of countries in order to mitigate the risk of any international political or social factors harming the ability to produce (Mattel, Inc. Company Profile 23).

Mattel's Weaknesses

Mattel's two main weaknesses are the recalls that occurred in the summer and fall of 2007 and its customer concentration. Mattel recalled twenty-one million toys in 2007, because of unsafe levels of lead paint and/or magnets that could be unattached from toys (Mattel, Inc. Company Profile 24). Total costs of the recall were "more than 100 million dollars" (Mattel, Inc. Company Pro-

file 24). Toys involving magnets were recalled by Mattel not because of a mistake by Chinese manufacturers but because of its own design mistake. Brazil banned Mattel from selling products in the country and will not allow Mattel to sell again until local safety standards are proven. Another weakness is the customer concentration that Mattel faces. Three main companies sell Mattel's products and its competitors' products. These companies have a large amount of power over Mattel because it can control negotiations and decide what to purchase and provide to other consumers, or expand their own private label brands (Mattel, Inc. Company Profile 25).

External Opportunities and Threats

Mattel's main opportunities surround its ability to make deals with other companies to either acquire them or partner with them to promote new products. Mattel acquired Radica, an electronic toy manufacturer. Radica's expertise in electronics is thought to be an important tool to expand Mattel's coverage of the U.S., UK, Canada, and Hong Kong as well as expand Mattel's product lines of electronic toys (Mattel, Inc. Company Profile 26). Bonne Bell, a cosmetics industry leader among girls in the "tween" category, and Mattel formed a partnership June 2007. The Barbie brand is expected to develop specialty stores. The partnership focuses on promoting the two brands as positive influences on girls (Mattel, Inc. Company Profile 26). The U.S. Census Bureau notes "children aged 0-4 years is expected to rise by 11% from 2000 to 2010, faster than the 9.5% growth in population" (Mattel, Inc. Company Profile 25). Grandparents from the Baby Boomer generation are beginning to acquire grandchildren and in response are buying gifts. Also, divorce rates are steadily growing, this usually brings about two households for children as well as buying associated with guilt that parents feel about leaving their child alone more often (Mattel, Inc. Company Profile 25).

Threats revolve around raw materials. Increasing crude oil prices effect profitability margins and may lead to more costs for making plastic toys (Mattel, Inc. Company Profile 26). The use of

raw materials has steadily increased from less than 150,000 tons in 2003 to less than 200,000 tons in 2005 (Mattel GRI Report). Federal minimum wage levels are increasing as well. Current levels are $5.85 per hour it will increase to at least $7.25 per hour by July 2009 (Mattel, Inc. Company Profile 26). Major customers that sell Mattel's toys are now directly competing with Mattel using private label brands. Those brands may sell more because the customers have control over their own shelf space and pricing (Mattel, Inc. Company Profile 27).

Mattel's Prices and Costs

Mattel's pricing with competitors is in line with their closest rivals. Wal-Mart, a company that sells most of the industry's products list prices for both toys from Mattel and toys from Hasbro very closely, products are listed side to side for instant comparison shopping (walmart.com). By comparing total revenue garnered each year to the total ending net income, Mattel's current costs can be determined. Revenue for 2006 was 5,650 million dollars and ending net income was 593 million dollars. (Mattel Stock Report 5) For Hasbro, revenue for 2006 was 3,151 million dollars and net income was 230 million dollars (Hasbro Stock Report 6). Although these numbers seem different, Hasbro's revenue can be divided into net income more times than Mattel and it could be interpreted that Hasbro has less current costs than Mattel. A continued focus on keeping costs of raw materials, transportation, and packaging must be considered consistently in order to keep costs down (Colbert 2).

Mattel's Competitive Position in Comparison to Key Rivals

Generally, Mattel has a strong position in the industry, this occurs due to the 13% market share the company holds, making it the largest toy company in the United States (Mattel Stock Report 2). Overall the quality and brands of Mattel make it a strong company. Consumers recognize Barbie and Hot Wheels. One analysis suggests, "two Barbies are sold every second. It has been estimated

that young females in the United States own an average of eight Barbie dolls, and that 95 percent of all young females have at least one (Business and Company Resource Center). This distinct brand image and recognition makes reputation and image most important to Mattel and Mattel's best strength. In comparison to the leading companies, Hasbro and Sony Corporation Mattel's scores are consistent, varying only slightly with Hasbro in several categories. Sony Corporation is best at its manufacturing capability because it does not count on as many outside vendors to produce an entire product line (Sony Stock Report 3).

Strength Assessment of Mattel and Leading Companies in the Industry (Scale: 1 = Very Weak; 10 = Very Strong)

(See adjacent page for full-size chart; Source: Thomas, Strickland, and Gamble 123).

Mattel's Strategic Issues and Problems to Ensure Future Success

Based on my analysis, Mattel must continue to focus on what it does best: develop new products, protect the brand image, and make deals with other companies to put forth more products. Developing new products with the new acquisition Radica that focus on being more technologically savvy and focusing on promoting positive image signaling for girls with Barbie and Bonne Bell will surround the company's strategy for the upcoming year (Mattel, Inc Company Profile 25-26). Protecting itself from negative brand image that can be related to the toy recalls will prove to be important as well. The company has already focused customer service relations on the problems and took a forty million charge for the costs of recalls (Birchall 1). Mattel must also consider how to cut costs in raw materials, especially if crude oil prices continue to rise (Mattel, Inc Company Profile 27). As long as these threats are met with an aggressive reaction and opportunities are taken according Mattel is positioned for strategic success in the upcoming fiscal year.

	Importance Weight	Mattel	Hasbro	Sony Corporation
Quality/ product performance	0.10	9	8	8
Reputation/ image	0.10	10	7	9
Manufacturing Capability	0.10	7	8	10
Technological skills	0.20	7	7	10
Dealer network and distribution capability	0.10	5	5	9
New product innovation capability	0.10	9	7	8
Financial resources	0.05	7	6	8
Relative cost position	0.05	6	7	6
Customer service capabilities	0.20	8	7	6

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A Nation of Sheep Will Be Ruled by Pigs

A Critical Opinion Piece

Mary Katherine Foster

If I were to tell you that supremely intelligent extraterrestrials had landed their flying saucers here in the United States, before sending out laser beams to evaporate all original thoughts from of the heads of the American people and brainwashing them into believing anything, you might laugh at me and tell me to share the crack-cocaine I must be taking. Despite the absurdity in that hypothetical situation, the fact is that it is not far from the truth, and no, George Bush is not the alien. It is the modern media that has seized control of the minds of the American people and brainwashed them into "eating what they're fed," in terms of political information.

"Media-based politics" have overtaken more traditional politics over the past five decades like a slow, festering weed threatening to choke out the very principles upon which this great country was founded. Americans have become increasingly dependent upon the media to tell them what to think, say, and do. Undeniably true, this constitutes that American politics as we know them, the idiot-proof, American-history-book-version we all read in the fifth grade, are utterly obsolete. No longer do we live in the democratic republic for which our forefathers fought and died to establish. Instead, we have sold out, living in an almost ancient, oligarchic form of government, where all the power is held by the few who hold the camera, and the crying masses are left in the darkness of ignorance as they are only told via the media's personal biases the contorted tip of an iceberg of truth. It seems ironic that the more available that political "knowledge" is to the public, the more ignorant they become on important matters.

If you think you're exempt from that "crying masses" category, you're wrong and most likely, exactly where the broadcast network CEOs want you. I would be willing to bet my parakeet that were your computer, television, gossip rags, teen-garbage magazines, and other forms of extraneous media taken away and replaced by classical literature, paper, and ink, within six hours you

would spontaneously combust because you didn't check your face-book or see what Britney Spears wore to the MTV Music Award. God forbid that you actually read something of substance.

Perhaps spontaneous combustion is a bit extreme, and your case would only progress to massive brain hemorrhage. Personally, I am. Disgusted by my young Face-book obsessed peers, I have done everything within my power to become a freethinking individual pursuing life, liberty, and happiness, never compromising because of social pressure, and always rising above propaganda.

Rivaling the disease of media-bias asphyxiation is chronic apathy, a complete lack of care or concern for the overall welfare of America, as long S.O.B.'s running it. What most Americans between the ages of 13 and 24 don't seem to realize is that the people who are actually in control of the country right now, i.e. Senators, congressmen, governors, the president, are going to retire eventually, and when they do, it will be the responsibility the younger generation to "step up to the plate," leading America into the future.

As viable citizens of the freest, most powerful nation in the history of the world, we must no longer allow ourselves to be enslaved to the media, absolutely dependent on it for any aspect of our lives. Let us take back America, reclaiming free thought and free choice for ourselves as well as our posterity while there is still time. Ignorance, apathy, and cowardice are not options in this day and age; coming at the price of terrorism, death, chaos, and tyranny, the cost of these pathetic excuses is simply too great.